



Severe Accident Treatment Update

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imagination at work



Objectives

- Discussion of containment performance goals
- ESBWR severe accident threats identified
- Progress report on resolution of severe accident issues

ESBWR Safety Goals

	NRC/EPRI	ESBWR
CDF	10^{-5} / year	Mean $\approx 10^{-7}$ / year
CCFP	0.1	Upper Bound ≤ 0.05

- CCFP has inherently high level of uncertainty
- ESBWR Level II PRA focus will be high confidence, upper bound

Approach to Severe Accident Assessment & Documentation

- Consistent approach built on CDF and Plant Damage States
- Mechanistic, best-estimate treatment of phenomena
 - ❖ Cognizant of uncertainty
 - ❖ Uncertainty captured in analysis
- Conservative treatment of both success and failure criteria for containment

ESBWR Severe Accident Threats

Address using ROAAM Methodology

- Direct Containment Heating
- Ex-Vessel Explosions
- Ex-Vessel Coolability
- Hydrogen Combustion
- Containment Overpressurization

Direct Containment Heating

- Dominant phenomenon in ABWR
- Relatively minor in ESBWR
 - ❖ Enhanced depressurization
 - ❖ Smaller SBO contribution
 - ❖ Containment pressures much lower (artifact of ABWR non-realistic analysis)
- Addressed in two ways
 - ❖ HP melt sequences \approx 1% of total
 - ❖ Higher confidence that containment survives DCH

Ex-Vessel Explosion

- Probability minimized through drywell floor temperature controlled flooding
- Fraction of sequences with LOCA-induced high water level in lower drywell is small

Ex-Vessel Coolability

- Large spreading area
- Automatic lower drywell flooder
- Drywell liner and sump protection

Codes show long-term cooling is viable

Hydrogen Combustion

- Threat does not contribute significantly to risk
 - ❖ Drywell atmosphere inerting
 - ❖ Design includes recombiners

Containment Overpressurization

- Passive containment cooling system
- Containment overpressure protection system

Multiple diverse & passive protection means will keep the probability of this threat very low

Conclusions

- Severe accident threats identified
- Robust treatment of each of the threats
- Uncertainty an integral part of analysis
- Reasonably low CCFP
- High confidence CCFP meets goals